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ABSTRACT

A study tested the hypothesis that the production of derivational (as contrasted with grammatical) morphemes is acquired through a systematic development of three distinct psychological processes: comprehension, segmentation, and production, regardless of whether the individual is a first- or second-language learner. The subjects were 32 children, grades 2-5, who were non-English-speaking Spanish speakers, limited-English-speaking Spanish speakers, Spanish-English bilingual, and monolingual English speakers. The test used consisted of 24 items probing the existence in the child of a generalized rule for deriving morphemes. Results suggest that the hypothesized processes are not systematically consistent across related forms of English, but vary within the morpheme type examined. Monolinguals showed the same facility across morpheme types, limited-English-speakers were more proficient in suffixes than prefixes, and bilinguals showed the reverse pattern. In native Spanish, a progression of processes emerged, with segmentation the easiest and first learned. Suffixes were better known than prefixes in Spanish. (MSE)

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PRODUCTIVITY OF DERIVATIONAL MORPHEMES AMONG BILINGUAL CHILDREN

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Introduction

This study focuses on the nature of the psychological processes inherent in the child's acquisition of derivational rather than grammatical morphemes. For purposes of this study, a derivational morpheme is defined as a sound or group of sounds added to a word stem such that (1) the part of speech of the stem is changed; or (2) a nongrammatical aspect of meaning is added to the stem. An inflectional morpheme, on the other hand, serves to define the part of speech of a word stem.

Examples of derivational morphemes in English which were chosen for the construction of the probe test used in this study are:

prefixes	(1)	re-	("again")	make	remake
	(2)	un-	("reversal")	tie	untie
suffixes	(3)	-y	(derives adjectives from nouns)		
	(4)	-able	(derives adjectives from verbs)		

The basic hypothesis underlying this study is that the production of these morphemes is acquired through a systematic development of three distinct psycholinguistic processes: (1) Comprehension, (2) Segmentation, and (3) Production irrespective of whether the child is a first or second language learner.

The study presented in this paper tests this hypothesis with native English-speaking children as constrasted to native Spanish-speaking children learning English as a second language. Thus, a questionnaire was also developed in Spanish to find out whether the same relationship among the hypothesized processes occurred in the native language as in the second language.

Examples of the derivational morphemes chosen for the Spanish tests are:

prefixes (1) re- (again) cortar recortar (cut) (recut)

(2) des- (reversal) abotonar desabotonar (to button) (to unbutton)

suffixes (3) -oso (a) (derives adjectives from nouns) envidia envidioso (a) (envy) (envious)

(4) -able (derives adjectives from verbs) amar amable (love) (friendly, kind)

The Questionnaire

Each questionnaire consists of 24 probe items representing two equivalent forms of the same test. The form presented first uses naturally occurring word stems in the probe items. The form presented second uses nonsense word stems in the probe items. Table 1 shows the design scheme for each form of the test. Use of the nonsense stems in the second form of each language test probes the existence of a generalized rule

for the process investigated.

For the first form of the questionnaire, each item consist of one or two sentences which establish the semantic content of a situation. This is followed by a sentence frame in which the child is to insert the processed word. Visuals are not used in this form of the questionnaire. For the second form, a nonsense stem appears in a sentence frame. Semantic circumstances are defined by visuals for the segmentation and production probes. The last four items were presented without visuals.

Each language questionnaire includes three types of probe items:

(1) those which require the child to segment a word into its morphological constituents by taking the derivational morpheme off a complex word presented;

(2) those which require the child to produce a word plus an affix consistent with the semantic content of a visual supplied by appropriately adding the derivational morpheme to a word stem presented;

(3) those which require the child to explain the semantic properties of an affixed word.

An example of a segmentation item is shown on the following for both languages:

When you go outside you have to button up your coat. When you come back in again what do you do to your coat?

(Answer: unbutton it)

Cuando sales de tu casa, tienes que abotonar tu abrigo. Cuando vuelves a entrar, ¿qué tienes que hacer con tu abrigo?

(Answer: desabotonarlo)

Methodology

Thirty-two children were selected at random at the same school site from four language proficiency groups as specified by scores on the Bilingual Syntax Measure. The groups were:

(1) Non-English-speaking
(2) Limited English-speaking
(3) Bilingual
(4) Monolingual English-speaking

Table 1

Design of Derivational Morpheme Test

MORPHEME PROBED		PROCESS PROBED	WORD STEM		ITEM NUMBER
English	Spanish		English	Spanish	
Naturally Occurring Word Stems					
UN-	DES-	production	button	abotonar	1
RE-	RE-	segmentation	read	cortar	2
-Y	-OSO(A)	segmentation	bush	lodo	3
-ABLE	-ABLE	segmentation	love	culpar	4
UN-	DES-	segmentation	tie	amarrar	5
RE-	RE-	production	heat	aparecer	6
-Y	-OSO(A)	production	dirt	mentira	7
-ABLE	-ABLE	production	chew	amiga	8
UN-	DES-	comprehension	cap	amar	9
RE-	RE-	comprehension	count	acomodar	10
-Y	-OSO(A)	comprehension	sand	envidia	11
-ABLE	-ABLE	comprehension	drink	aceptar	12
Nonsense Word Stems					
-Y	-OSO(A)	production	wug	chuba	13
RE-	RE-	production	kent	melar	14
UN-	DES-	production	glot	pichar	15
-ABLE	-ABLE	production	tring	gufar	16
RE-	RE-	segmentation	nop	machar	17
UN-	DES-	segmentation	bick	marbar	18
-ABLE	-ABLE	segmentation	tam	nomar	19
-Y	-OSO(A)	segmentation	droon	grotón	20
RE-	RE-	comprehension	figg(ed)	pichar	21
UN-	DES-	comprehension	clagify	tivar	22
-ABLE	-ABLE	comprehension	darf	porsar	23
-Y	-OSO(A)	comprehension	toop	folo	24

Within each language group two children each were selected for each of four grade levels (2-5). The LES, Bilinguals, and English speakers took the test in English. The non-English-speaking, the LES and the Bilinguals took the test in Spanish. The order of presentation of the Spanish and the English version of the test were randomized for language effect.

Two three-way Analyses of Variance, one for each language, were performed on the date. The experimental design for each language test was a three x two x three factorial with repeated measures on the last two factors. The factors are: Language Proficiency (English, LES, Bilingual), Morpheme (Suffix, Prefix), and Process (Comprehension, Segmentation, Production).

Results and Conclusions

Table 2 shows the elementary statistics for the performances of the monolingual English-speakers, the LES, and the Bilinguals on the English test at each level of process for each level of morpheme. Table 3 shows the relationship of Morpheme and Process for this same group on the same test. Table 4 shows the relationship between Group and Process for the same subjects. Table 5 shows the summary of the Analysis of variance for English responses.

Significant main effects were found only for Groups. That is, the level of English proficiency the children possessed served

to discriminate them from each other on this test. The lack of significant main effects for either Process or Morpheme can be explained by the significant interaction effects of Groups with Morpheme and Morpheme with Process.

Table 3 schematically shows the relationship between Morpheme and Process. What is happening here is that regardless of language proficiency, the relationship among the processes differs as the type of morpheme examined differs. Thus Comprehension is the easiest process for the English suffixes (-y, -able), while Segmentation and Production lag behind. For the Prefixes (re- and un-), in contrast, Comprehension shows the poorest performance across the groups, with Segmentation and Production preceding it. Thus, the only generalization that can be made about the processes is that irrespective of language proficiency, Comprehension is the least difficult process for the suffixes examined, but the most difficult one for the prefixes examined.

Table 4 shows the relationship between the significant interaction, Group and Morpheme. In this case, the differences in ease of performance of the morpheme types was dependent on the group examined. Monolingual English-speakers show little or no difference in performance between the two types of morphemes. LES students, however, perform better on Suffixes than they do on the Prefixes. In fact, the LES children outperform the bilingual group on Suffixes. The bilingual group,

on the other hand, showed better facility on Prefixes compared to Suffixes, and outperformed their LES counterparts on Prefixes.

TABLE 2

Elementary Statistics for the English Morpheme Test Expressed in Transformed Scores

Group		Prefixes (re-, un-)			Suffixes (-y, -able)		
		Comp.	Seg.	Prod.	Comp.	Seg.	Prod.
Monolingual English	$\bar{x}$	1.5629	2.4555	1.5708	2.1440	1.7592	1.5054
n = 8 $\bar{x}_1$ = 11.0057	s	.7214	.6946	.3958	.6255	.8684	.1851
LES	$\bar{x}$	.3747	.9400	1.860	1.7672	1.3248	1.6363
n = 8 $\bar{x}_2$ = 7.2290	s	.5934	.7980	.5224	.8501	.8115	.9166
Bilingual	$\bar{x}$	.9400	1.9556	1.0630	1.4399	1.0709	1.2515
n = 8 $\bar{x}_3$ = 7.7120	s	.7980	.5927	.6580	1.1651	.8977	.9673

Duncan's Range test for simple effects showed significant difference between English speakers and LES, and between English speakers and Bilinguals, but not between LES and Bilinguals (R_2 = 1.2806, R_3 = 1.3444 standard error = .4341.)

TABLE 3

The Relationship Between Morpheme and Processes

	Prefixes (re-, un-)	Suffixes (-y, -able)
Monolingual English	S > P > C	C > S > P
LES	P > S > C	C > P > S
Bilingual	S > P > C	C > P > S

TABLE 4

The Relationship Between Group and Morpheme

		Prefixes (re-, un-)		Suffixes (-y, -able)
Monolingual English	$\bar{x}$	1.8631	PRE $\geq$ SUF	1.8015
LES	$\bar{x}$	1.0582	SUF > PRE	1.5761
Bilingual	$\bar{x}$	1.3195	PRE > SUF	1.2541

TABLE 5

Analysis of Variance Summary Table
English Morpheme Test

Source	SS	df	MS	F	p
Total	105.0414	143			
Between Subj.	42.9064	23			
Groups (C)	11.2420	2	5.6210	3.7284	< .05
error between	31.6599	21	1.5076		
Within Subjects	62.1350	120	.5178		
Morpheme (A)	1.5351	1	1.5351	4.0676	n.s.
Process (B)	1.4866	2	.7433	1.6986	n.s.
CxA	5.1669	2	2.5835	6.8455	< .01
CxB	3.4417	4	0.1504	.0344	n.s.
AxB	8.9424	2	4.4712	13.2206	< .01
CxAxB	1.0491	4	0.2623	.7756	n.s.
$Error_1$	7.9224	21	.3774		
$Error_2$	18.3808	42	.4376		
$Error_3$	14.2040	42	.3382		

Implications of this study are that the hypothesized processes for language learning of the morphemes tested are not systematically consistent across related forms of English, but vary with the morpheme type examined.

Overall knowledge of each morpheme type examined is effected by language proficiency group. Thus, monolinguals show approximately the same facility irrespective of the morpheme tested, LES students, however, were more proficient in suffixes than in prefixes; whereas their bilingual counterparts showed just the reverse pattern of performance.

The results of the Spanish performances are shown in tables 6 and 7. Main effects were significant for Morpheme and Process but not for groups. Segmentation was significantly greater than Production or Comprehension, but Comprehension and Production were not significantly different from each other (Duncan's Range test.) Suffixes are better performed than prefixes. This fact might explain why the LES students performed better on English suffixes than did the bilinguals.

The results of the Spanish testing imply that there is a progression of processes in the native-speakers learning of Spanish with segmentation being the easiest and perhaps first learned process. Suffixes are better known than prefixes perhaps because of the strong inflectional patterns of Spanish.

TABLE 6

Elementary Statistics for Spanish
Morpheme Test Expressed in Transformed Scores

Group		Prefixes (re-, des-)			Suffixes (oso(a), -able)		
		Comp.	Seg.	Prod.	Comp.	Seg.	Prod.
Spanish Only	$\bar{x}$	.7437	1.2436	.6207	1.3090	1.4399	1.3169
n = 8	s	.5906	.2710	.6200	.8978	.3702	.6684
LES	$\bar{x}$	.8746	1.3169	.9897	1.3090	1.5054	1.5054
n = 8	s	.7059	.6684	.4167	.8978	.3356	.4370
Bilinguals	$\bar{x}$	1.0630	1.3824	.6782	1.2515	1.3169	1.1860
n = 8	s	.7150	.6639	.5092	.9673	.6070	.5927

		Comp.	Seg.	Prod.
(S,L,B)	$\bar{x}$	1.0713	1.36751	1.0495
	s	.7536	.4928	.6125

TABLE 7

Analysis of Variance Summary Table
Spanish Morpheme Test

Source	SS	df	MS	F	p
Total	61.56206	143	-	-	
Between Subjects	24.95604	23	-	-	
Groups (C)	.49501	2	.247505	.2125	n.s.
error between error within	24.46103 26.60669	21	1.1648109	-	
Within Subjects	36.60602	120	-	-	
Morpheme (A)	4.63206	1	4.63206	92.33354	.05
Process (B)	2.86302	2	1.43151	4.467984	.05
C x A	.46064	2	.23032	4.5911024	.05
C x B	.64016	4	.16004	.4995118	n.s.
A x B	1.32925	2	.664625	2.306931	n.s
C x A x B	0.0742	4	.01855	.0643884	n.s.
$Error_1$	1.0535	21	.05016666	-	
$Error_2$ (B, C x B)	13.4565	42	.32039285	-	
$Error_3$	12.1000	42	.28809523	-	